

REMARKS

Applicant respectfully requests further examination and reconsideration in view of the above amendments and arguments set forth fully below. Claims 1-14 and 18-26 were previously pending in this application. Within the Office Action, Claims 1-14 and 18-26 have been rejected. By above amendments, Claims 1, 10, and 26 have been amended. Accordingly, Claims 1-14 and 18-26 are now pending in this application.

Amendments to the Claims

By above amendments, Claims 1, 10, and 26 have been amended to further include the claim limitation *wherein the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound.*

Support for this amendment can at least be found in the specification, which discloses that “[t]he feedstock can include methanol in amounts of about 50 to 96 weight percent of the feedstock, about 73 to 96 weight percent of the feedstock, and preferably about 90 to 96 weight percent of the feedstock.” [Parp 0030, Present Application] Accordingly, no new matter has been added.

Rejections Under 35 U.S.C. § 103(a)

Within the Office Action, Claims 1-14 and 18-26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the Japanese Publication No. 05-097583-A to Shinya (hereafter “Shinya”), in view of U.S. Patent No. 5,236,545 to Pryor (hereafter “Pryor”) and either U.S. Patent No. 5,451,260 to Versteeg et al. (hereafter “Versteeg”) or U.S. Patent No. 5,874,014 to Robson et al. (hereafter “Robson”). The Applicants respectfully disagree.

By above amendments, Claims 1, 10, and 26 have been amended to further include the claim limitation *wherein the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound.*

Neither Shinya, Pryor, Versteeg, Robson, nor their combination teach that the amount of methanol is greater than the amount of the at least one carbon and oxygen containing compound. As recognized in the Office Action, Shinya does not teach the at least one carbon and oxygen containing compound. [p.6, Office Action] Further, Pryor only teaches the possibility of having a

mixture comprising hydrogen and carbon containing gas. [line 1-30, col.9, Pryor] Versteeg and Robson also do not teach that the amount of methanol is greater than the amount of the at least one carbon and oxygen containing compound. Accordingly, neither Pryor, Shinya, Versteeg, Robson, nor their combination teach that the amount of methanol is greater than the amount of the at least one carbon and oxygen containing compound. Based on the amended claim limitations alone, Claims 1, 10 and 26 are in the condition for allowance. The applicants respectfully request the rejections based on 35 U.S.C. § 103 be withdrawn.

Additionally, the Applicants respectfully further submit the following reasons to support the withdrawal of 35 U.S.C. § 103 rejections.

It is recognized in the Office Action that Shinya does not teach that the *liquid precursor contains methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one*. [p.6, Office Action] To maintain the rejections, Pryor is cited within the Office Action as a teaching of the claim limitations that Shinya does not teach. The Office Action relied on the arguments of reasonable expectation of success and yield predictable results to maintain the rejections under 35 U.S.C. § 103(a).

It is provided in the MPEP 2143 that “[t]o reject a claim based on this rationale [Predictable Solutions, or With a Reasonable Expectation of Success], Office personal must resolve Graham factual inquiries. Then, **Office personal must articulate the following:**

- (1) a finding that at the time of the invention, there had been a recognized problem or need in the art, which may include a design need or market pressure to solve a problem;
- (2) a finding that there had been a finite number of identified, predictable potential solutions to the recognized need or problem;
- (3) a finding that one of ordinary skill in the art could have pursued the known potential solutions with a reasonable expectation of success; and
- (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

The rationale to support a conclusion that the claim would have been obvious is that "a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely that product [was] not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103." *KSR*, 550 U.S. at ___, 82 USPQ2d at 1397. If any of these findings cannot be made, then this

rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.”(emphasis added)

The Applicants respectfully submit that the findings set forth in the MPEP 2143 have not been satisfied within the Office Action. Therefore according to MPEP 2143, the Predictable Solutions and Reasonable Expectation of Success rationales stated in the Office Action are insufficient to sustain the obviousness rejections.

To facilitate the prosecution and assist the examination, the Applicants respectfully provide reasons to show that the factors listed in MPEP 2143 cannot be established by the combinations of Shinya and Pryor. Therefore, the rejections under 35 U.S.C. § 103(a) should be withdrawn.

First, the Present Application has **satisfied the needs** of having high growth rates and more uniform and reproducible diamond growth by using a **mixture of methanol and a carbon and oxygen containing compound in the absent of hydrogen stream** environments. The above mentioned advantageous features can be obtained by using the mixture capable of generating methanol radicals to etch the deposited diamonds while the oxygen and carbon containing compound enhanced the deposition of the diamonds. [para 28 and 31, Present Application]

The combination of Shinya and Pryor cannot produce the feature as disclosed in the Present Application, because the essential non-eliminatable element, hydrogen, in Pryor is used to terminate the carbon surface to provide a sp^3 extended up bonding surface for nucleation. [col.7, line 46-64, Pryor] Thus, if the mixture of Pryor were combined with Shinya, it would have only generated a hydrogen terminated carbon surface for easier nucleation and faster deposition. The mixture of Pryor and Shinya will not produce “uniform” diamonds, because fast nucleation can lead to a lesser uniform but fast deposition of the diamonds. Accordingly, the combination of Shinya and Pryor will not satisfy the needs that are offered by the Present Application.

Second, the combination of Shinya and Pryor will not generate **predictable potential solutions** that are provided in the Present Application. As described above, the combination of Shinya and Pryor will only offer nucleation to facilitate the speed of diamond deposition. The combination of Shinya and Pryor will not provide **uniform diamond** deposition. Uniform diamond deposition of the Present Application is achieved by having the methanol and the

oxygen and carbon containing compound and control the rate of etching performed by the radical generated by the methanol relative to the rate of deposition enhanced by the oxygen and carbon containing compound. Accordingly, the technical solutions provided by the Present Application is not predictable and not attendable by the combination of the teachings of Shinya and Pryor.

Third, the combination of Shinya and Pryor will not produce **a reasonable expectation of success** toward the Present Application. Shinya specifically teaches to eliminate the need of hydrogen and hydrocarbon gases, because they are explosive and combustibility. [Abstract, Shinya] Nonetheless, Pryor teaches that hydrogen gas is essential, because Pryor requires hydrogen gas to terminate the surface of carbon forming up-extending sp^3 carbon surface. [Abstract and Col. 7, line 46-64, Pryor] Accordingly, the combination of Shinya and Pryor **will not have a reasonable expectation of success** toward the Present Application, because the introduction of mixed hydrogen and hydrocarbon gases of Pryor with the no hydrogen and no hydrocarbon gases allowed system of Shinya is fundamentally unfunctional.

As discussed above, all the factors are weighed in favor of non-obviousness of the Present Application and against the combinations of Shinya and Pryor. Thus, the Applicants respectfully request the withdrawal of the obviousness rejections that are based on grounds of **reasonable expectation of success and predictable results**.

Moreover, each of the following grounds is individually sufficient to render that the combination of Shinya and Pryor is improper.

First, it is provided in MPEP 2141 that “a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.” *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983)

It is stated in the Office Action that “Pryor is simply used by the examiner to show that using a mixed methanol/ethanol solution instead of just methanol is beneficial to the process and will obtain similar result” and “the examiner does not suggest that the entire precursor mixture of Pryor that include hydrogen is substituted into Shinya and vice versa,” the combination of the teachings of Shinya and Pryor is **essentially impermissible** under the guidelines of MPEP and case law.

As stated above, it is an improper combination of references by taking methanol and ethanol out from Pryor's hydrogen gas composition to combine with the system of Shinya, which specifically states that hydrogen gas cannot be used. As such, the combination by taking part of the compositions of Pryor to combine with Shinya is improper.

Second, it is also provided in MPEP 2145 that “[i]t is improper to combine references where the references teach away from their combination.” *In re Grasselli*, 713 F.2d, 743 (Fed. Cir. 1983) (emphasis added).

Shinya taken as a whole **teaches away** from the combination of Shinya and Pryor. Shinya teaches that “to eliminate the need for hydrogen..., an OH group containing alcohol (e.g. methanol or ethanol) is used as a reaction gas and is not diluted with hydrogen to form a diamond file.” [Abstract, Shinya] In contrast, Pryor teaches that “[t]he feedstock gases which are used to create the vapor include hydrogen.” [l. 15-17, Col. 9, Pryor]

As described above, Shinya specifically teaches that hydrogen gas should not be used; however, Pryor specifically teaches that hydrogen gas is one of the required reactants in his system. Accordingly, Shinya **teaches away** from the combination with Pryor which requires a hydrogen gas in the system. As such, under the holding of the Federal Circuit in *Grasselli* and the instructions under MPEP 2145, the combination of Shinya and Pryor is improper. The applicant respectfully submits that the 35 U.S.C. 103 rejections based on the combination of Shinya and Pryor as references should be removed.

Third, the MPEP states, “[i]f the proposed modification would render the prior art invention modified *unsatisfactory for its intended purpose*, then there is no suggestion or motivation to make the proposed modification.” *In re Gordon*, 733 F.2d 900, (Fed. Cir. 1984); MPEP §2143.01 (emphasis added).

The purpose of Shinya's teaching is using OH group-containing alcohol as a reactant gas to eliminate the danger of using hydrogen gas. [Abstract, Shinya] In contrast, Pryor requires hydrogen gas to terminate the surface of the carbon. [Abstract, Pryor] The combination of Shinya and Pryor clearly makes the respective teaching **unsatisfactory for their intended purposes**, because substituting the reactants containing hydrogen gas of Pryor would defeat the purpose of eliminating hydrogen gas of Shinya. Similarly, replacing the system without the hydrogen gas of Shinya will defeat the purpose of Pryor, which requires hydrogen gas to terminate the surface of

carbon. Accordingly, under the guidelines of the MPEP and the holding of In re Gordon, the combination of Shinya and Pryor is improper.

Fourth, the MPEP states, “[i]f the proposed modification or combination of the prior art would change the *principle of operation* of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” In re Ratti, 270 F.2d 810, (CCPA 1959); MPEP §2143.01.

Shinya uses OH group-containing alcohol as a reaction gas to substitute the use of dangerous hydrogen gas. [Abstract, Shinya] In contrast, Pryor requires hydrogen gas to terminate the surface of the carbon. [Abstract, Pryor] Pryor further teaches that “a carbon surface prepared without atomic hydrogen is thought to have ‘flattened’ C-C bonds on the surface which are not expected to provide especially suitable or sufficient nucleation sites for CVD diamond deposition.” [line 47-64, col 7. Pryor] As described above, Shinya’s operational principle will be substantially changed if the dangerous hydrogen gas of Pryor is introduced. Similarly, Pryor’s operational principle will not work, if Shinya were modified to be combined with Pryor, since the hydrogen gas free system of Shinya will not provide a hydrogen terminated sp³ carbon surface to make nucleation centers as desired by Pryor. The modification of Shinya to Pryor can only provide flattened C-C bonds on the carbon surface as described by Pryor. Accordingly, under the guidelines of MPEP and the holding of In re Ratti, the combination of Shinya and Pryor is improper.

The independent Claim 1 is directed to a method of forming diamond. The method of Claim 1 comprises providing a substrate in a reaction chamber in a non-magnetic-field microwave plasma system, providing, in the absence of a gas stream, a liquid precursor substantially free of water and containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one, to a metering valve associated with an inlet of the reaction chamber, wherein the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound, passing liquid precursor into the reaction chamber inlet with the metering valve wherein the liquid precursor enters the metering valve as liquid and vaporizes during entry into the reaction chamber inlet to generate vaporized precursor and subjecting the vaporized precursor, in the absence of a carrier gas and in the absence of a reactive gas, to a plasma under conditions effective to disassociate the

vaporized precursor and promote diamond growth on the substrate in a pressure range from about 70 to 130 Torr. As discussed above, the combination of Shinya, Pryor, Versteeg and Robson is improper. As also discussed above, neither Shinya, Pryor, Versteeg, Robson nor their combination teach *containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one*. Further, neither Shinya, Pryor, Versteeg, Robson nor their combination teaches *the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound*. For at least these reasons, the independent Claim 1 is allowable over the teachings of Shinya, Pryor, Versteeg, Robson and their combination.

Claims 2-9 are all dependent on the independent Claim 1. As described above, the independent Claim 1 is allowable over the teachings of Shinya, Pryor, Versteeg, Robson and their combination. Accordingly, Claims 2-9 are all also allowable as being dependent on an allowable base claim.

The independent Claim 10 is directed to a method of forming diamond. The method of Claim 10 comprises providing a substrate in a reaction chamber in a non-magnetic-field microwave plasma system, the reaction chamber being in fluidic communication with a container through a metering valve, wherein the container includes a liquid precursor substantially free of water containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one, wherein the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound, flowing the liquid precursor into the reaction chamber using the metering valve, in the absence of a gas stream flowing through the metering valve entraining the liquid precursor, wherein the liquid precursor enters the metering valve as liquid and vaporizes during entry into the reaction chamber, subjecting the vaporized precursor to a plasma under conditions effective to disassociate the vaporized precursor in the absence of a carrier gas and in the absence of a reactive gas and promoting diamond growth on the substrate at a pressure in the range from about 10 to 130 Torr. As discussed above, the combination of Shinya, Pryor, Versteeg and Robson is improper. As also discussed above, neither Shinya, Pryor, Versteeg, Robson nor their combination teach a *liquid precursor substantially free of water containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one, wherein the amount of*

the methanol is greater than the amount of the at least one carbon and oxygen containing compound. For at least these reasons, the independent Claim 10 is allowable over the teachings of Shinya, Pryor, Versteeg, Robson and their combination.

Claims 11-14 and 18-25 are all dependent on the independent Claim 10. As described above, the independent Claim 10 is allowable over the teachings of Shinya, Pryor, Versteeg, Robson and their combination. Accordingly, Claims 11-14 and 18-25 are all also allowable as being dependent on an allowable base claim.

The independent Claim 26 is directed to a method of forming diamond without seeding. The method of Claim 26 comprises providing an unseeded substrate in a reaction chamber in a non-magnetic-field microwave plasma system, the reaction chamber being in fluidic communication with a container through a metering valve, wherein the container includes a liquid precursor substantially free of water containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one, wherein the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound, supplying the liquid precursor into the reaction chamber without interrupting formation of the diamond using the metering valve, in the absence of a gas stream flowing through the metering valve entraining the liquid precursor, wherein the liquid precursor enters the metering valve as liquid and vaporizes during entry into the reaction chamber, subjecting the vaporized precursor to a plasma under conditions effective to disassociate the vaporized precursor in the absence of a carrier gas and in the absence of a reactive gas and promoting diamond growth on the substrate at a pressure in the range from about 10 to 130 Torr. As discussed above, the combination of Shinya, Pryor, Versteeg and Robson is improper. As discussed above, neither Shinya, Pryor, Versteeg, Robson nor their combination teach *a liquid precursor substantially free of water containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one, wherein the amount of the methanol is greater than the amount of the at least one carbon and oxygen containing compound.* For at least these reasons, the independent Claim 26 is allowable over the teachings of Shinya, Pryor, Versteeg, Robson and their combination.

For the reasons given above, Applicant respectfully submits that Claims 1-14 and 18-26 are now in a condition for allowance, and allowance at an early date would be appreciated. Should the Examiner have any questions or comments, the Examiner is encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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